Performance Metrics for High-Resolution Ocean Models

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LONG-TERM GOALS

Develop metrics to quantitatively assess the realism of mesoscale ocean models to be used in synoptic global ocean prediction systems.

OBJECTIVES

Assess the realism of the mean and variability of the upper-ocean circulation in a fine-resolution ocean general circulation model by calculating and comparing statistical quantities from upper ocean data sets and consistent model representations. Use these statistics to establish the integrity of the ocean solution, particularly the mesoscale.

APPROACH

In this extension year, we revised a manuscript (now published) summarizing results from earlier years. The model used in these analyses is the global 0.1°, 40-level configuration of the Parallel Ocean Program (POP) simulation that was initialized from the Navy's Modular Ocean Data Assimilation System (MODAS) 1/8° January climatology outside of the Arctic and the University of Washington's Polar Hydrography winter climatology in the Arctic. To produce an energetically realistic ocean state, synoptic forcing was used whenever possible. The forcing was largely constructed from National Center for Environmental Prediction (NCEP) fluxes (Doney et al., 2003) for 1979-2003. Surface momentum, heat, and salt fluxes were calculated using bulk formulae (Large et al., 1997) and a combination of daily NCEP analyses, monthly Internal Satellite Cloud Climatology Project (ISCCP) radiation data, and monthly Microwave Sounding Unit (MSU) and Xie-Arkin precipitation data. The Large et al. (1994) mixed layer formulation, K-Profile Parameterization (KPP), was active. A discussion of the model set-up and analyses of the first 15 years of the run can be found in Maltrud and McClean (2005). Post spin-up analyses of the fidelity of this simulation can be found in McClean et al. (2006).

WORK COMPLETED

A book chapter entitled "The Fidelity of Ocean Models with Explicit Eddies" was published as part of the AGU Monograph Series "Eddy-Resolving Ocean Modeling". The manuscript reviews current practices within the oceanographic community with regard to the use of metrics to assess the realism of

the upper-ocean circulation, ventilation processes diagnosed by time-evolving mixed layer depth and mode water formation, and eddy heat fluxes in large-scale fine resolution ocean model simulations.

IMPACT/APPLICATIONS

Using these metrics to evaluate ocean models to be used for operational Navy needs will lead to model improvements and eventually improved forecasts.

TRANSITIONS

Methodology and data results can be made available to Navy scientists.

PUBLICATIONS

McClean, J.L., S. Jayne, M.E. Maltrud, D.P. Ivanova: The Fidelity of Ocean Models with Explicit Eddies. In "Eddy-Resolving Ocean Modelling", M. Hecht and H. Hasumi, Eds., *AGU Geophysical Monograph Series*, Volume 170, pp.149-163, 2008.